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minutes. The plates were measured on the Hartmann Spectro-Comparator with the following values of the velocity:

Date, 1918	Velocity Preceding Star	Velocity Following Star
Oct. 19	-5.7	-5.8
" 24	-7.9	-3.0
" 29	-8.6	-3.5
Nov. 24	-6.5	-5.4
Dec. 15	-8.3	-3.3
Means	-7.4	-4.2

The probable error of a single plate so far as it means anything from so few observations is $\pm 0.85^{\text{km}}$ per second.

The difference in velocity is of the order to be expected if the star were a binary and this taken in conjunction with the small separation, the equality in magnitude and type make a chain of coincidences improbable on any supposition except that the stars are physically connected.

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Dominion Astrophysical Observatory,
Victoria, B. C., Jan. 15, 1919.

FOURTEEN SPECTROSCOPIC BINARIES

Spectroscopic observations of the following stars made at Mount Wilson with the 60-inch reflector and the Cassegrain spectrograph show variations in the radial velocity.

TU *Cassiopeiae* $\alpha = 0^{\text{h}} 21^{\text{m}}$ $\delta = +50^{\circ} 43'$ $m = 7.2-8.6$

This star is a Cepheid variable with a period of 2.14 days. Three observations show a range between -4 and -43^{km} . The spectral type as based upon the hydrogen lines varies from F0 at maximum to F9 at minimum of light. As in the case of other Cepheids the remaining lines of the spectrum, with the exception of the enhanced lines, show little change.

Boss 373 = Σ 145 $\alpha = 1^{\text{h}} 36^{\text{m}}$ $\delta = +25^{\circ} 14'$ $m = 6.3$

This is a most interesting binary, with the spectra of both components present. It is the brighter star of the visual binary. The maximum relative velocity observed among twelve spectrograms is 167^{km} . The spectra of the two components are nearly the same, and are estimated as F3. The period of variation is about four days, and the orbit is now under investigation.

Boss 593 $\alpha = 2^{\text{h}} 31^{\text{m}}$ $\delta = +24^{\circ} 13'$ $m = 6.6$

This is the brighter star of the visual binary Σ 5. A large number of spectrograms have been obtained and the computation of the orbit is nearly completed. The variation in velocity is from -10 to $+36^{\text{km}}$ in a period of 9.85 days. The spectrum of the star is F4.

$$\circ \Sigma 82 \quad \alpha = 4^{\text{h}} 17^{\text{m}} \quad \delta = +14^{\circ} 49' \quad m = 7.0$$

The brighter star of this visual binary is a spectroscopic binary. Four spectrograms show a range of 41^{km} . The spectral type is F8.

$$\text{Boss } 1131 \quad \alpha = 4^{\text{h}} 43^{\text{m}} \quad \delta = +18^{\circ} 33' \quad m = 6.8$$

Seven spectrograms show a range between $+41$ and $+70^{\text{km}}$. The spectral type is G0.

$$\text{TT } \textit{Aurigae} \quad \alpha = 5^{\text{h}} 3^{\text{m}} \quad \delta = +39^{\circ} 28' \quad m = 8.5-9.2$$

This star is an Algol variable investigated photometrically by Joy, with a period of 1.33 days. Photographs of its spectrum show the presence of two components of nearly the same spectral type which is estimated as B5. The maximum relative velocity so far observed exceeds 450^{km} . The spectrum is very difficult of measurement, the lines due to the second component being especially faint and diffuse.

$$\text{Boss } 2285 \quad \alpha = 8^{\text{h}} 31^{\text{m}} \quad \delta = +6^{\circ} 58' \quad m = 6.0$$

Fourteen spectrograms of this star show a variation in velocity of from -3 to $+41^{\text{km}}$. The period is about 14 days, and the orbit is now under investigation. The spectral type is F8.

$$\text{Boss } 2447 = 75 \textit{ Cancr}i \quad \alpha = 9^{\text{h}} 3^{\text{m}} \quad \delta = +27^{\circ} 3' \quad m = 6.0$$

Six spectrograms show a range in velocity of 32^{km} . The spectrum is of type G1.

$$\text{S } \textit{Antliae} \quad \alpha = 9^{\text{h}} 28^{\text{m}} \quad \delta = -28^{\circ} 12' \quad m = 6.3-6.8$$

This star is classed in the catalogs as a Cepheid variable with a period of light variation of 0.3 day. Shapley has interpreted it, however, as a rotating ellipsoid (*A. N.* **194**, 353, 1913). The spectrum is extraordinarily difficult of measurement, being of type A6p with broad indistinct lines. There seems to be little doubt, however, of a variation in velocity of the order of 100^{km} . Six spectrograms have been secured, and on three of these the presence of a secondary spectrum is suspected. The spectral type of this star is entirely different from that of the normal Cepheid variables.

$$\text{Lalande } 29330 \quad \alpha = 16^{\text{h}} 1^{\text{m}} \quad \delta = +10^{\circ} 57' \quad m = 8.5$$

Eight photographs of the spectrum give velocities ranging between -21 and -94^{km} . The spectrum is of type Ko. The absolute magnitude of the star is about 6.7.

$$205 \text{ } \textit{Draconis} \quad \alpha = 18^{\text{h}} 45^{\text{m}} \quad \delta = +49^{\circ} 19' \quad m = 7.2$$

This star shows an interesting spectrum of double lines on three of the six photographs. The maximum observed relative velocity is 203^{km} . The two spectra are closely alike in type, being estimated as F2. The intensities of the lines in the two spectra are approximately in the ratio of 3 to 2.

$$\text{Boss } 5591 \quad \alpha = 21^{\text{h}} 40^{\text{m}} \quad \delta = +28^{\circ} 19' \quad m = 6.9$$

Five out of six spectrograms of this star show double lines with a maximum relative velocity of 195^{km} . The period of variation is probably a few days. The spectra of the two components are similar, being of type Fo, and the lines are of nearly equal intensity. This star is near μ Cygni.

$$\text{Boss } 5683 \quad \alpha = 22^{\text{h}} 2^{\text{m}} \quad \delta = +82^{\circ} 23' \quad m = 7.5$$

This star is the fainter component of the visual binary Σ 2873. Seven spectrograms have been measured, of which the last shows the presence of a faint secondary spectrum with a displacement of 175^{km} relative to that of the principal star. The lines of the primary spectrum show a variation in velocity of from $+43$ to -123^{km} . The spectrum of the principal star is G4p.

$$\text{Lalande } 46867 \quad \alpha = 23^{\text{h}} 50^{\text{m}} \quad \delta = +28^{\circ} 5' \quad m = 7.0$$

Six spectrograms of this star show a range of from $+27$ to -55^{km} . The spectral type is K2.

W. S. ADAMS
A. H. JOY

A VERY FAINT STAR OF SPECTRAL TYPE F

In the number of this journal for December, 1917, I announced the discovery of a faint star with a proper motion of $3''.01$ annually. Its position is

$$\alpha_{1900} = 0^{\text{h}} 43^{\text{m}} 52^{\text{s}} \quad \delta_{1900} = +4^{\circ} 55'$$

Mr. Seares later published photovisual and photographic magnitudes: 12.34 and 12.91, respectively. The spectrum was found to be Fo.

Sixteen plates have since been secured for the determination of parallax; the result is

$$\pi_{\text{rel.}} = +0''.244 \pm 0''.008$$